January 1, 2020

Actuarial Valuation Report

Fitchburg Retirement System

Lawrence B. Stone

stoneconsulting,inc
5 West Mill Street, Suite 4
Medfield, Massachusetts 02052
T: 508.359.9600 • F: 508.359.0190
Lstone@stoneconsult.com

stoneconsulting,inc

November 22, 2020

Fitchburg Retirement Board
c/o City Hall
166 Boulder Drive
Fitchburg, MA 01420

To the Fitchburg Retirement Board:

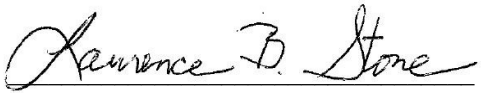
Stone Consulting, Inc. has performed a January 1, 2020 actuarial valuation of the Fitchburg Retirement System. This valuation and report were prepared using generally accepted actuarial principles and practices. To the best of our knowledge, this report is complete and accurate, and the assumptions used represent our best estimate of anticipated experience of the system except where noted in the text.

Stone Consulting, Inc. is completely independent of the City of Fitchburg and the Fitchburg Retirement System. This includes any of its officers and key personnel. Neither we or anyone else closely associated with us has any relationship with the City of Fitchburg or the Fitchburg Retirement System that would impair our independence, other than this or related assignments.

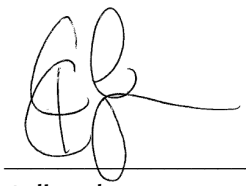
We are pleased to present the results of this valuation. If the Retirement Board has any questions on the content of this report, we would be glad to respond. Please note that this report is meant to be used in its entirety. Use of excerpts of this report may result in inaccurate or misleading understanding of the results. The use of these results may not be appropriate for all circumstances.

We, Lawrence Stone and Colin Edgar, are consultants for Stone Consulting, Inc. Lawrence Stone is a member of the American Academy of Actuaries, and Colin Edgar is an Associate of the Society of Actuaries; we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,
STONE CONSULTING, INC.
Actuaries for the Plan



Lawrence B. Stone
Member, American Academy of Actuaries



Colin Edgar
Associate of the Society of Actuaries

5 West Mill Street, Suite 4 • Medfield, Massachusetts 02052 • T: 508.359.9600 • Lstone@stoneconsult.com

TABLE OF CONTENTS

PAGE

Certification Letter
Report Summary 1
Format of the Report 1
Development of Funding Schedule 2
Funding Schedule 3
History of Funding Effort 4
Components of Funding Appropriation 5
Net 3(8)(c) Payments 5
Development of Actuarial Results 6
Net Normal Cost 7
Unfunded Liability 8
Demographic Results 10
History of Demographic Statistics 10
Distribution of Plan Members 11
Assets 13
Actuarial Value of Assets 13
Three-Year Asset Smoothing 14
Funding Ratio 15
Risk 16
Maturity 16
Historical Experience 17
History of Assets and Unfunded Liability 17
History of Unfunded Liability and Covered Payroll 17
Comparative Results 18
APPENDICES 19
Appendix A – Actuarial Methods and Assumptions 19
Appendix B – Summary of Principal Provisions 24
Appendix C – Glossary of Terms 28
PERAC Information Disclosure 29

Report Summary

This report presents the results of the actuarial valuation of the Fitchburg Retirement System as of January 1, 2020. The valuation was performed at the request of the Retirement Board for the purpose of determining the contribution requirements for Fiscal Year 2022 and beyond.

Summary of Results and Experience
▪ Experience and Funding Schedule The contribution is equal to the projected FY2022 contribution from the prior valuation. The schedule is based on annual contribution increases of 6.00%, except for the final year, when it decreases by 44.05%. The funding schedule is 12-years long, finishing in FY2033, consistent with the planned funding schedule from the 2018 valuation. The funding ratio based on Actuarial Value of Assets increased from 44% to 48%.
▪ Assumptions/methodology: Assumption changes increased the liability by $1.3 million, including a reduction of the discount rate from 7.25% to 7.00%. Assumptions and valuation methodology are discussed in Appendix A, on page 19.

Contribution requirements are based on the financial condition of the system as of December 31, 2019, as well as actuarial liability results, which are based on:

- The benefit provisions of M.G.L. Chapter 32 and related statutes;
- The demographics of members in the system (i.e., active and inactive participants, retirees and beneficiaries as of January 1, 2020);
- Economic assumptions regarding salary increases and investment earnings; and
- Other actuarial assumptions (e.g., withdrawals, retirement, death, etc.)

Format of the Report

- The funding schedule is shown on page 3, followed by an explanation of the actuarial results, funding schedule components, and a history of the funding schedules used by the Retirement System.
- Full actuarial valuation results are shown on page 18, with prior results included for comparison. The Fitchburg Retirement Board conducted their previous actuarial valuation effective January 1, 2018.

Development of Funding Schedule

The funding contribution consists of three parts:

- Net Normal Cost: this is the amount of liability generated by active employees earning another year of service, and includes administrative expense.
- Amortization: this is the amount of the Unfunded Liability that will be paid off by this contribution.
- Net 3(8)(c) Payments: these are benefit payments made to other systems for service earned as a member of the Fitchburg Retirement System.

The appropriation for Fiscal 2022 is as follows:

Net Employer Normal Cost for Fiscal 2022 (including admin. expenses)	$	2,075,966
Net 3(8)(c) Payments		109,305
Amortization		13,078,521
Timing Adjustment*		0
Total Appropriation required for Fiscal 2022	$	15,263,793

* Contributions are assumed to be made at the beginning of the fiscal year.

NOTE: for all tables in this report, totals may not sum due to rounding.

- The schedule's length is twelve (12) years which is consistent with the 12 years remaining from the 14-year schedule from the January 1, 2018 valuation. The maximum funding schedule length allowed by Section 22F of Chapter 32 of the Massachusetts General Laws is nineteen years to Fiscal 2040.
- Fitchburg's funding schedule was developed by setting the contribution to increase by 6.00% annually, except for the final year, when it decreases by 44.05%.

The schedule is shown on the following page.

FITCHBURG CONTRIBUTORY RETIREMENT SYSTEM

FUNDING SCHEDULE

Fiscal Year	Unfunded Liablity	Recognition of asset (loss)/gain*	Normal Cost	Funding Amortization of UAAL	Net 3(8)(c) Payments	Schedule Contribution**	% Change
2022	147,697,333	-	2,075,966	13,078,521	109,305	15,263,793	6.00%
2023	144,042,128	2,857,416	2,159,005	13,911,310	109,305	16,179,620	6.00%
2024	136,382,560	-	2,245,365	14,795,727	109,305	17,150,397	6.00%
2025	130,097,910	-	2,335,179	15,734,937	109,305	18,179,421	6.00%
2026	122,368,382	-	2,428,587	16,732,295	109,305	19,270,186	6.00%
2027	113,030,613	-	2,525,730	17,791,362	109,305	20,426,398	6.00%
2028	101,905,998	-	2,626,759	18,915,917	109,305	21,651,982	6.00%
2029	88,799,387	-	2,731,830	20,109,966	109,305	22,951,100	6.00%
2030	73,497,681	-	2,841,103	21,377,758	109,305	24,328,166	6.00%
2031	55,768,317	-	2,954,747	22,723,804	109,305	25,787,856	6.00%
2032	35,357,628	-	3,072,937	24,152,886	109,305	27,335,128	6.00%
2033	11,989,075	-	3,195,854	11,989,075	109,305	15,294,234	-44.05%
2034	-	-	3,323,688	-	109,305	3,432,994	-77.55%

Amortization of Unfunded Liability as of July 1, 2021

* The currently unrecognized asset gains of $2,762,368 will be recognized in the 1/1/2022 valuation. The asset gain will be adjusted with interest to the beginning of Fiscal 2023 to the amount shown in the schedule and will reduce the Fiscal 2024 Unfunded Liability

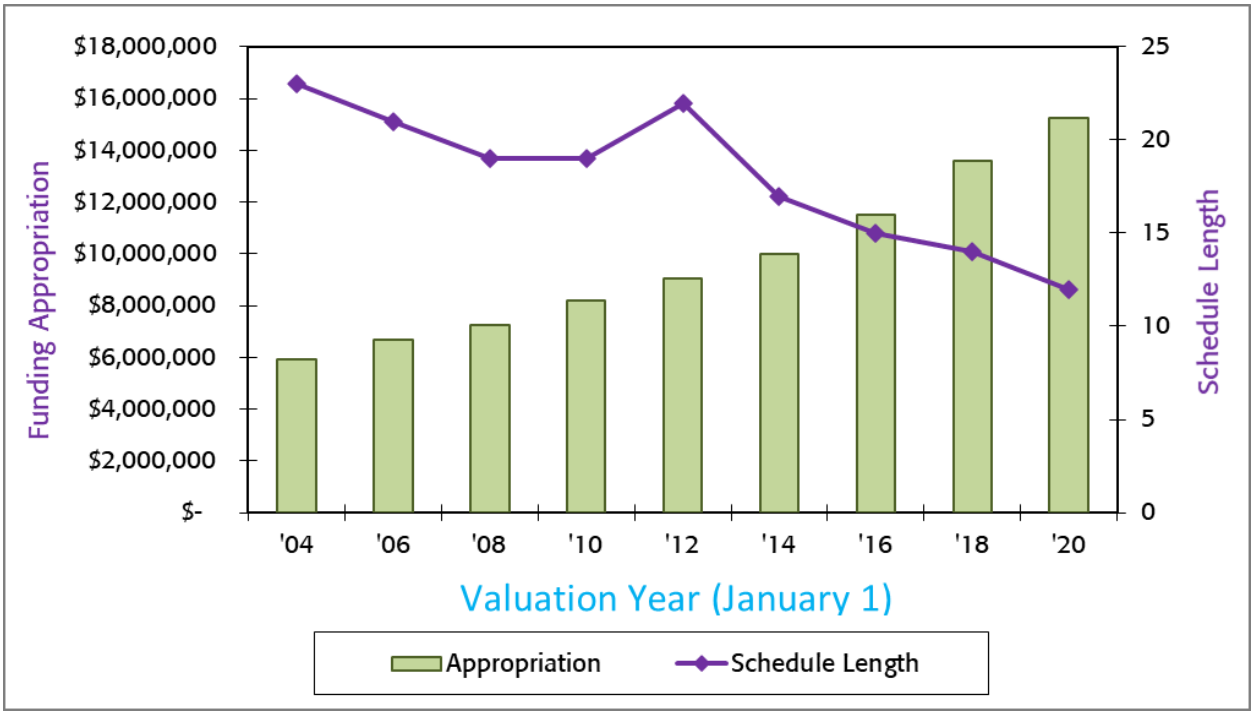
** Contributions are set to be the amount resulting from a 6% increase on the prior year's contribution. The contribution in FY2033 decreases by -44.05%.

Bases in the funding schedule:

- Amortization of the unfunded actuarial accrued liability: 12 years.

History of Funding Effort

Below is a history of the length of funding schedule used by the Fitchburg Retirement System, and the amount of the initial contribution for each funding schedule.

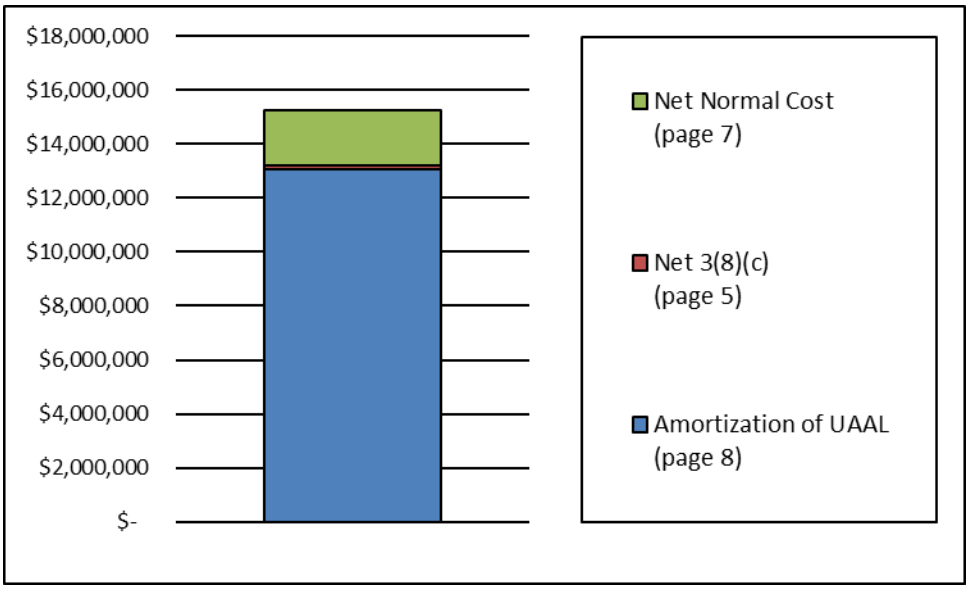


The funding objective of the plan is to fully fund the system while attempting to maintain a stable contribution amount for the upcoming fiscal year that is consistent with prior funding schedules or if employer finances allow it, to increase the contribution amount. This funding objective is being met.

The following pages discuss the components that make up the contribution, and how they are calculated from the actuarial results.

Components of Funding Appropriation

Components of the funding contribution are compared below, and discussed on the following pages.



Net 3(8)(c) Payments

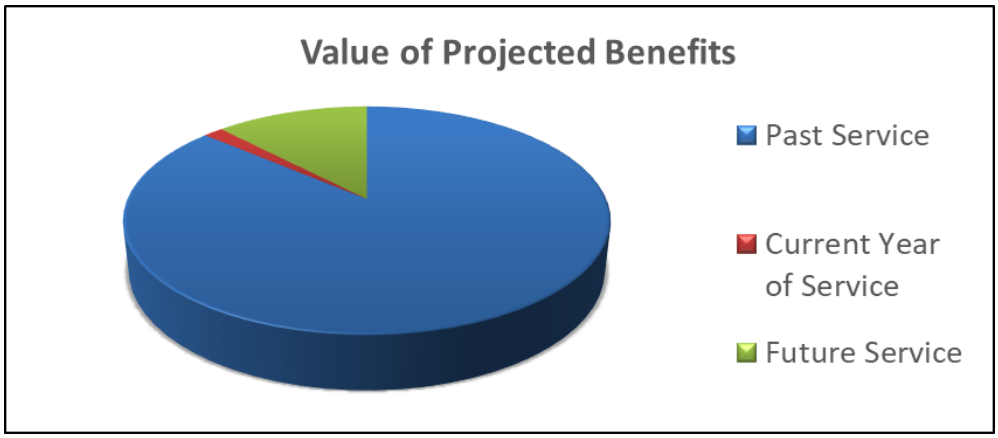
- 3(8)(c) payments are benefits which the Fitchburg Retirement System pays to or receives from other retirement boards for service that a retiree had with a different retirement system.
- The net amount is equal to what Fitchburg pays out, less what Fitchburg receives from other systems, based on the most recent PERAC annual statement:

3(8)(c) payments made to other systems	$	370,677
3(8)(c) payments received from other systems		(261,372)
Net payments in funding schedule	$	109,305

- For the funding schedule, the amount of net payments is assumed to remain level in future years.

Development of Actuarial Results

Actuarial liabilities are calculated based on benefits that members are projected to receive in the future. The value of projected benefits is divided between past service, future service, and the current year of service.



The actuarial funding method (in this case, entry age normal), assigns values to each of these periods of service.

- Past service: The Actuarial Accrued Liability (AAL), is the portion of the benefit value that is associated with past service; this can be thought of as the "price" of benefits already earned by members of the system.

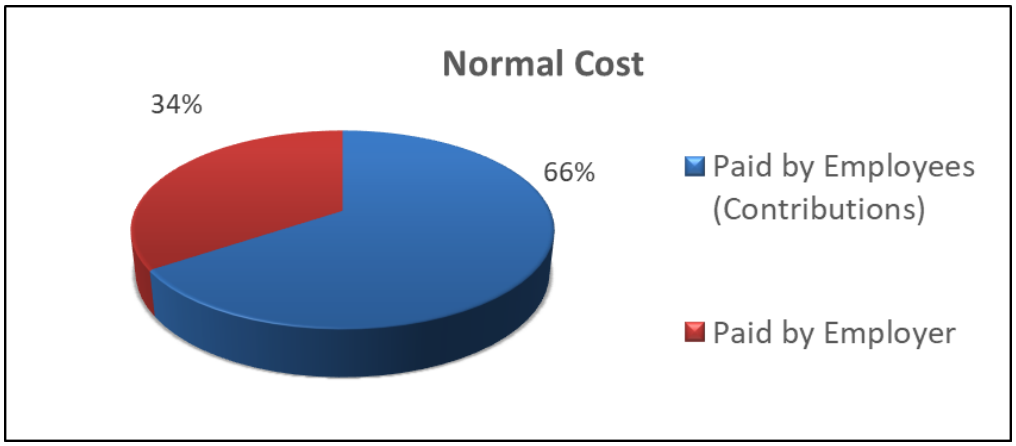
- Current year: The "price" of benefits being earned during the current year is referred to as the Normal Cost (NC). This includes only the actives, as neither inactives nor retirees are earning any additional service.

- Future service: The amount for future service is not included in the liability, as those years of service have not yet been earned.

For retirees, the "past service" amount accounts for the entire value of their benefits; they have completed their careers, and will earn no more service during the current year or any future years.

Net Normal Cost

The entire Normal Cost is not borne by the System; a significant portion is paid by employee contributions. The portion of the Normal Cost not covered by employee contributions is the amount that must be paid through funding appropriations; this is the Net Normal Cost.



The Net Normal Cost as seen in the funding schedule is calculated by adjusting for timing, and adding in the administrative expense. The calculation is shown below, and compared to the covered payroll:

	January 1, 2020	% of Payroll*
Gross Normal Cost (GNC)	$ 4,906,096	14.1%
Employees Contribution	3,219,008	9.3%
Net Normal Cost (NNC)	$ 1,687,088	4.9%
Adjustment to beginning of Fiscal Year 2022**	102,231	
Administrative Expense	286,647	0.8%
Adjusted Net Normal Cost With Admin. Expense	$ 2,075,966	

* Payroll paid in 2019 for employees as of January 1, 2020 is $34,694,937. Payroll for new hires in 2019 was annualized.

** The NNC is adjusted from January 1, 2020 to Fiscal 2022 by rolling it forward with a payroll increase factor of 4.00%.

Unfunded Liability

The Unfunded Actuarial Accrued Liability (UAAL) is the portion of the AAL that is not covered by the value of the plan assets.

This is adjusted from the date of the valuation to the date of the contribution (July 1, 2021) to produce the Unfunded Liability seen in Fiscal Year 2022 in the funding schedule.

The liability results were as follows:

	January 1, 2020
Actuarial Accrued Liability	
a. Active Members	$ 103,395,678
b. Inactive Members	1,207,047
c. Retired Members and Beneficiaries	171,229,728
d. Total	$ 275,832,453
Unfunded Actuarial Accrued Liability	
a. Actuarial Accrued Liability	$ 275,832,453
b. Less Actuarial Value of Assets	131,246,880
c. Unfunded Actuarial Accrued Liability	$ 144,585,573
d. Adjustment to FY2022	3,111,760
e. Unfunded Actuarial Accrued Liability as of FY2022	$ 147,697,333

In developing the funding schedule, we used a "fresh start" approach in which the UAAL (not counting Early Retirement Incentives) is amortized from scratch instead of maintaining the existing amortization amount and separately amortizing gains and losses. This can result in a schedule in which the changes in contribution amounts from year to year are more consistent.

The UAAL and funding ratio are measures of the plan's funded status, which reflect the plan's position as of January 1, 2020. We believe these measures, by themselves, are not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations. However, we believe these measures, in conjunction with the plan's funding schedule and unrecognized gains/losses, are appropriate for assessing the amount of future contributions.

Active Liability by Decrement

An active member can incur liabilities for the Retirement System in one of four ways:

- They can retire (if eligible),
- They can become disabled and collect a disability benefit,
- They can die, or
- They can terminate service and withdraw their ASF balance or receive a deferred retirement benefit

Active members have a portion of their liability associated with each of these four outcomes. The Accrued Liability for active members is divided as follows:

Active Actuarial Accrued Liability	
Superannuation Retirement	$ 94,905,440
Death	1,998,209
Disability	5,641,046
Withdrawal	850,983
TOTAL	$ 103,395,678

Demographic Results

Actives	
a. Number	682
b. Annual Compensation	$34,694,937
c. Average Annual Compensation	$50,872
d. Average Attained Age	46.2
e. Average Past Service	11.3
Retired, Disabled and Beneficiaries	
a. Number	588
b. Total Benefits (excluding State COLA)	$16,505,953
c. Average Benefits	$28,071
d. Average Age	72.8
Inactives	
a. Number	161

- Total compensation changed by 6.5% over the prior valuation
  - Average annual compensation changed by 3.8%
  - Salary gain of $3.3 million compared to projected experience (1.2%)

History of Demographic Statistics

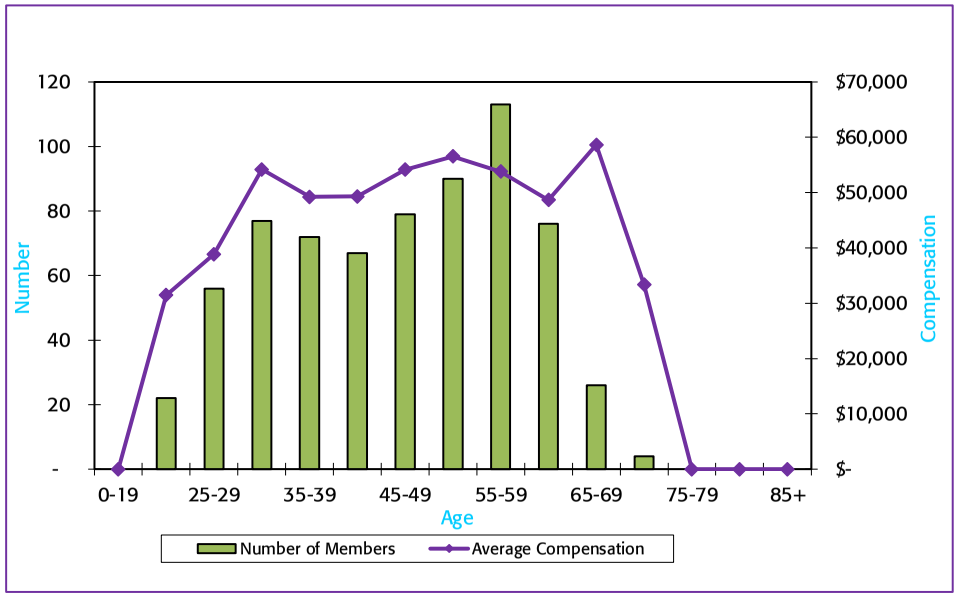
Valuation Year	Actives	Average Age	Average Past Service	Average Ann'l Pay
2020	682	46.2	11.3	$50,872
2018	665	46.3	11.4	$48,997
2016	648	47.2	12.0	$47,339
2014	605	47.2	12.6	$45,624
2012	613	48.1	12.7	$44,125
2010	589	49.2	13.8	$44,398
2008	661	48.3	13.1	$42,922
2006	713	47.0	11.8	$39,949
2004	691	46.6	11.4	$36,696
2002	802	45.1	10.4	$33,065
2000	740	45.1	10.7	$29,689

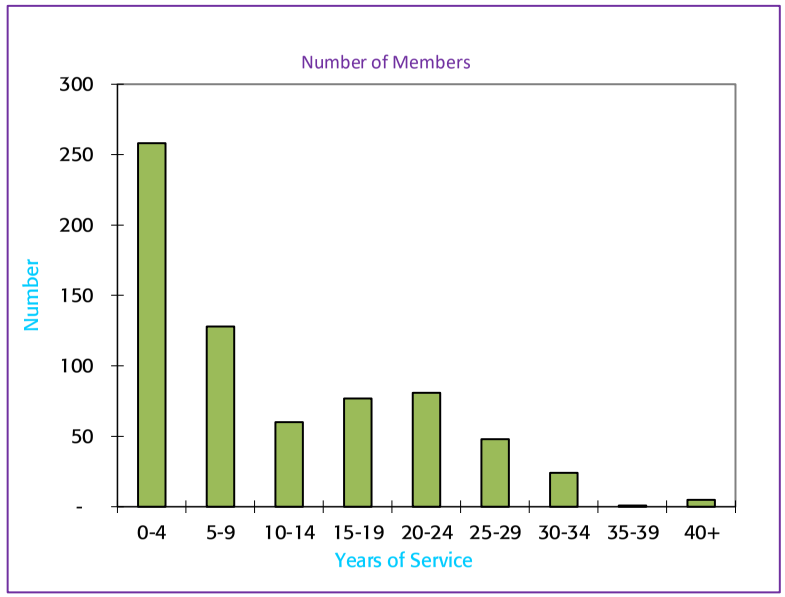
- Both employee age and service have decreased in recent years, following years of increases. This pattern has appeared in the experience of several systems in the Commonwealth. Average annual compensation has grown by 171% (2.7% annually) over the past twenty years.

Distribution of Plan Members as of January 1, 2020

ACTIVE MEMBERS

AGE	0-4 Years	5-9 Years	10-14 Years	15-19 Years	20-24 Years	25-29 Years	30-34 Years	35-39 Years	40 + Years	Total	Total Compensation	Average Compensation
0-19	-	-	-	-	-	-	-	-	-	-	$ -	$ -
20-24	22	-	-	-	-	-	-	-	-	22	$ 692,401	$ 31,473
25-29	52	4	-	-	-	-	-	-	-	56	$ 2,177,111	$ 38,877
30-34	46	27	4	-	-	-	-	-	-	77	$ 4,172,457	$ 54,188
35-39	37	19	12	4	-	-	-	-	-	72	$ 3,544,543	$ 49,230
40-44	33	13	7	10	3	1	-	-	-	67	$ 3,305,020	$ 49,329
45-49	25	11	10	9	20	4	-	-	-	79	$ 4,278,927	$ 54,164
50-54	12	22	7	11	12	23	3	-	-	90	$ 5,089,989	$ 56,555
55-59	20	22	12	20	16	8	14	1	-	113	$ 6,078,461	$ 53,792
60-64	8	7	7	18	21	8	4	-	3	76	$ 3,697,898	$ 48,657
65-69	2	1	1	4	9	4	3	-	2	26	$ 1,524,858	$ 58,648
70-74	1	2	-	1	-	-	-	-	-	4	$ 133,273	$ 33,318
75-79	-	-	-	-	-	-	-	-	-	-	$ -	$ -
80-84	-	-	-	-	-	-	-	-	-	-	$ -	$ -
85+	-	-	-	-	-	-	-	-	-	-	$ -	$ -
TOTAL	**258**	**128**	**60**	**77**	**81**	**48**	**24**	**1**	**5**	**682**	**$ 34,694,937**	**$ 50,872**





stoneconsulting,inc

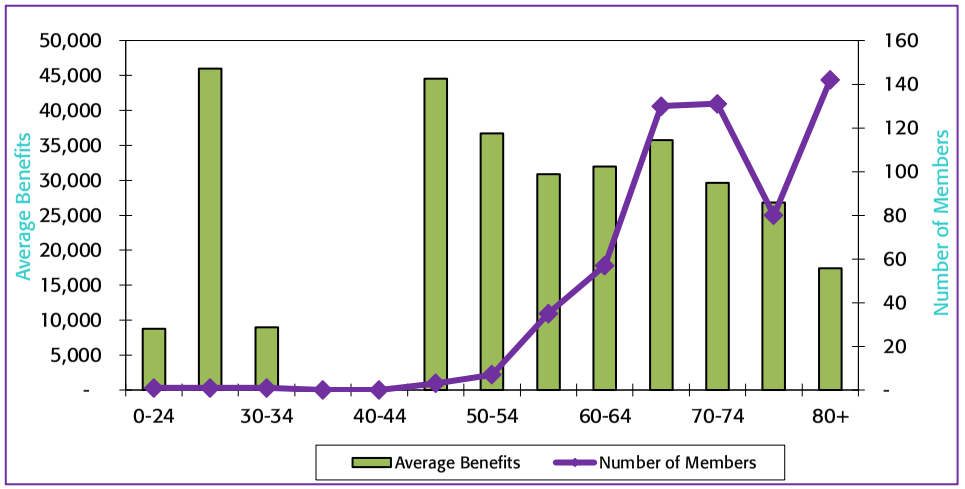
Distribution of Plan Members as of January 1, 2020

RETIRED MEMBERS

Retired Members and Beneficiaries			
Age	Number	Average Benefit	Total Benefit
0-24	1	8,751	8,751
25-29	1	45,951	45,951
30-34	1	8,957	8,957
35-39	-	-	-
40-44	-	-	-
45-49	1	18,774	18,774
50-54	3	26,228	78,683
55-59	28	31,144	872,030
60-64	47	30,757	1,445,580
65-69	117	34,952	4,089,330
70-74	118	29,370	3,465,621
75-79	70	26,723	1,870,604
80+	131	17,582	2,303,189
TOTAL	**518**	**$ 27,428**	**$ 14,207,470**

Disabled Members			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	-	-	-
30-34	-	-	-
35-39	-	-	-
40-44	-	-	-
45-49	2	57,427	114,853
50-54	4	44,546	178,184
55-59	7	29,687	207,809
60-64	10	37,528	375,279
65-69	13	42,740	555,622
70-74	13	32,437	421,684
75-79	10	27,809	278,087
80+	11	15,179	166,965
TOTAL	**70**	**$ 32,835**	**$ 2,298,484**

Total			
Age	Number	Average Benefit	Total Benefit
0-24	1	8,751	8,751
25-29	1	45,951	45,951
30-34	1	8,957	8,957
35-39	-	-	-
40-44	-	-	-
45-49	3	44,543	133,628
50-54	7	36,695	256,868
55-59	35	30,853	1,079,839
60-64	57	31,945	1,820,859
65-69	130	35,730	4,644,952
70-74	131	29,674	3,887,305
75-79	80	26,859	2,148,691
80+	142	17,395	2,470,153
TOTAL	**588**	**$ 28,071**	**$ 16,505,953**



Benefits shown are net of State reimbursed COLA.

stoneconsulting,inc

Assets

	Cash	$	1,700,666.07
	PRIT FUND		132,259,241.63
A	Sub-Total:	$	133,959,907.70
	Accounts Receivable	$	95,713.79
	Accounts Payable		(46,373.85)
B	Sub-Total:	$	49,339.94
	Market Value of Assets [(A) + (B)]	$	134,009,247.64

- The asset allocation is approximately 21% fixed income, cash, receivables and payables and 79% equities, alternative investments, hedge funds and similar types of investments. The asset allocation is dynamic and more variable than in most retirement systems.

- Annual return in calendar 2018-2019: 6.3% vs. a 7.25% assumption.
  - $1,640,263 net actuarial asset loss in Calendar Years 2018 through 2019

Actuarial Value of Assets

For its Actuarial Value of Assets (AVA), Fitchburg uses a three-year asset smoothing method which recognizes gains and losses over a three-year period. For example, for a gain in 2018, 33.33% would be recognized in 2019, another 33.33% in 2020, and the final 33.33% in 2021.

The AVA is $131.2 million, $2.8 million lower than the MVA. The calculation of the smoothed asset value is shown on the following page.

Three-Year Asset Smoothing

1. Market value of assets including receivable/payable as of 01/01/2020 $ 134,009,248

2. Phase-in of asset gains and losses

	Plan Year (1)	Original Amount (2)	Percent Unrecognized (3)	Amount Unrecognized (2) x (3)
a.	2019	$9,927,367	66.67%	$6,618,245
b.	2018	($11,567,630)	33.33%	($3,855,877)
c.	2017	$9,375,917	0%	$0
d.	2016	($622,242)	0%	$0
e.	Total	$7,113,412		$2,762,368

3. Valuation assets without corridor as of 01/01/2020 $ 131,246,880
   (1. - 2.e.)

4. Corridor Check
   a. 85% of Market Value $ 113,907,860
   b. 115% of Market Value $ 154,110,635

5. Valuation assets with corridor as of 01/01/2020 $ 131,246,880
   (3. within Corridor)

6. Calculation of return on valuation assets

   a. Valuation assets as of 01/01/2018 $ 114,692,143

   b. ER contribs + EE contribs - Ben Pymts - Expenses $ (2,176,283)

   c. Actual return on valuation assets $ 18,731,020
      5. - (6.a. + 6.b.)

   d. Weighted value of valuation assets $ 113,261,306

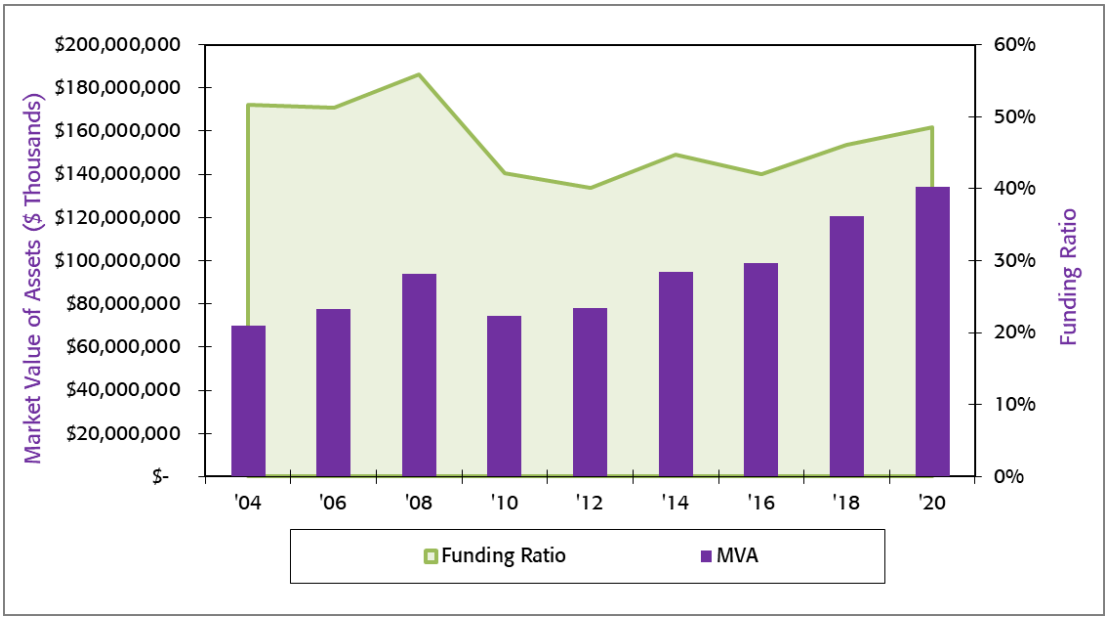
   e. Return on valuation assets 16.54%
      (6.c. / 6.d.)

   f. Annualized return on assets 7.95%

The benefit of using an asset smoothing method is that it results in a more stable measure of the financial condition of the Plan. This is illustrated by the chart below, which displays a history of the Actuarial Value and Market Value of Assets over the past nine valuations.

Funding Ratio

The following displays the history of the funding ratio for the past nine valuations, based on Market Value of Assets. The Market Value for each year is shown to accompany the funding ratio. We show the market value of assets as that is the amount of assets actually available to pay for benefits.



Funding ratio as of 1/1/2020:

- 48.6% using Market Value of Assets
- 47.6% using Actuarial Value of Assets

Risk

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as:

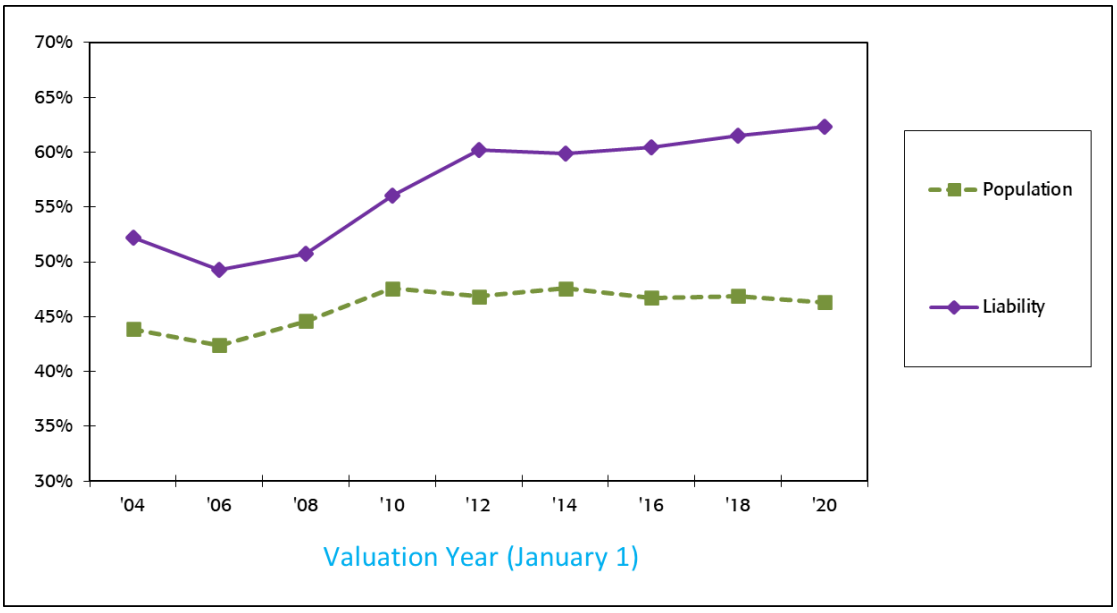
- Plan experience differing from that anticipated by the economic or demographic assumptions,
- Changes in economic or demographic assumptions,
- Increases or decreases expected as part of natural operation of the methodology used for these measurements such as additional contribution requirements based on the plan's funded status,
- Changes in plan provisions or applicable law.

As part of the valuation, we have not performed an analysis of the potential range of future measurements. GASB Statement 67 and 68 reports for the Fitchburg Retirement System contain alternate results to measure the impact of increases or decreases in the discount rate.

Maturity

One important concern is the maturity of the system. Systems with a greater portion of their liability stemming from current retirees whose benefits already being paid are likely to experience greater impact from short-term asset experience, as high payouts in the near future leave less of the current assets will be available to benefit from investment returns further in the future.

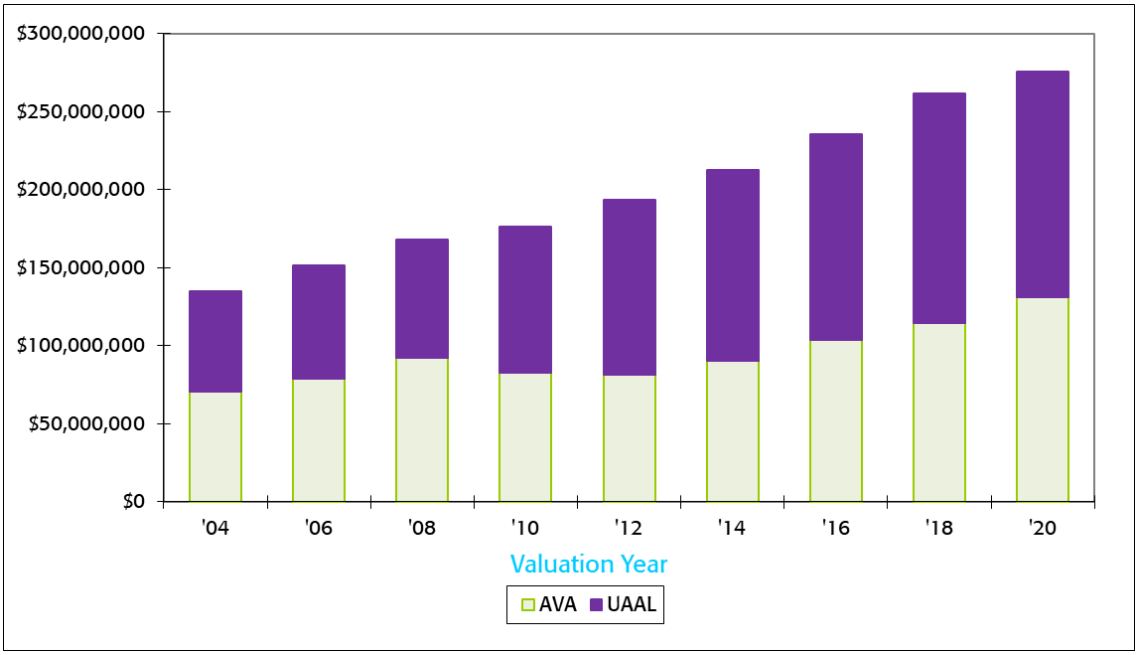
Below is a history of the retiree's percentage of the covered population and liability. The retiree share of the population has remained relatively stable over the past nine valuations, while the retiree share of the liability has increased.



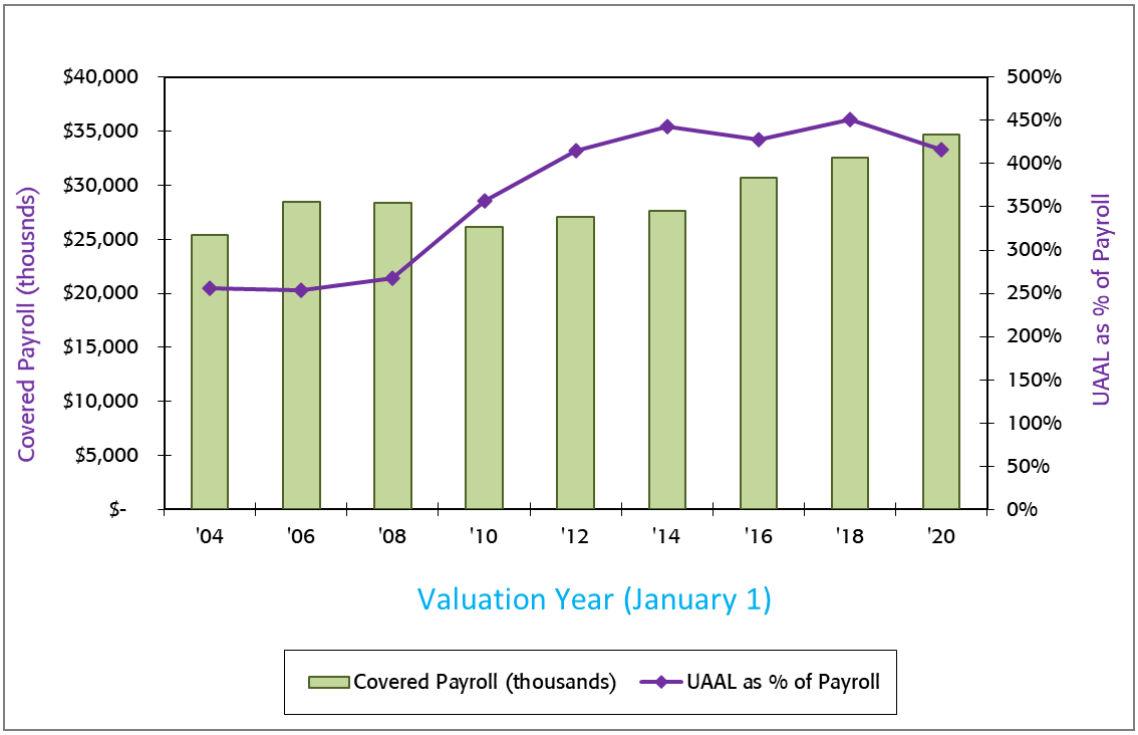
Historical Experience

The following charts display Fitchburg's history of Actuarial Assets and Unfunded Liability; the second chart compares the unfunded liability to covered payroll.

History of Assets and Unfunded Liability



History of Unfunded Liability and Covered Payroll



Comparative Results

	January 1, 2020	January 1, 2018	Percentage Change
Funding			
Contribution for Fiscal 2022	$15,263,793	$15,263,793	0.0%
Members			
▪ Actives			
a. Number	682	665	2.6%
b. Annual Compensation	$34,694,937	$32,583,145	6.5%
c. Average Annual Compensation	$50,872	$48,997	3.8%
d. Average Attained Age	46.2	46.3	-0.2%
e. Average Past Service	11.3	11.4	-0.8%
▪ Retired, Disabled and Beneficiaries			
a. Number	588	587	0.2%
b. Total Benefits*	$16,505,953	$15,544,476	6.2%
c. Average Benefits*	$28,071	$26,481	6.0%
d. Average Age	72.8	73.0	-0.2%
▪ Inactives			
a. Number	161	155	3.9%
Normal Cost			
a. Total Normal Cost as of January 1, 2020	$4,906,096	$4,610,665	6.4%
b. Less Expected Members' Contributions	3,219,008	3,021,567	6.5%
c. Normal Cost to be funded by the Municipality	$1,687,088	$1,589,098	6.2%
d. Adjustment to July 1, 2021	102,231	96,293	6.2%
e. Administrative Expense Assumption	286,647	270,334	6.0%
f. Normal Cost Adjusted to July 1, 2021	$2,075,966	$1,955,725	6.1%
Actuarial Accrued Liability			
a. Active Members	$103,395,678	$100,216,458	3.2%
b. Inactive Members	1,207,047	1,535,688	-21.4%
c. Retired Members and Beneficiaries	171,229,728	160,048,143	7.0%
d. Total	$275,832,453	$261,800,289	5.4%
Unfunded Actuarial Accrued Liability			
a. Actuarial Accrued Liability	$275,832,453	$261,800,289	5.4%
b. Less Actuarial Value of Assets	131,246,880	114,692,143	14.4%
c. Unfunded Actuarial Accrued Liability	$144,585,573	$147,108,146	-1.7%
d. Adjustment to FY2022	3,111,760	5,762,157	
e. Unfunded Actuarial Accrued Liability as of FY2022	$147,697,333	$152,870,303	

* Excluding State reimbursed COLA

APPENDICES

Appendix A – Actuarial Methods and Assumptions

All assumptions and methodologies were either set by statute or selected by the Fitchburg Retirement Board in conjunction with guidance provided by Stone Consulting, Inc.

Stone Consulting, Inc. was furnished member and financial data by the Fitchburg Retirement System's administrative staff. Although examined under broad parameters for reasonableness, the data was not audited by the actuary. With the assistance of the staff of the Fitchburg Retirement Board, we were able to develop a database sufficient for valuation purposes.

ASSUMPTION AND METHODOLOGY CHANGES SINCE PRIOR VALUATION

- Salary increases assumption (shown in detail on the following page)
- Mortality assumption: RP-2014 adjusted to 2006, projected generationally using MP-2019
  - The prior valuation used the same table, projected with MP-2016
  - This decreased the liability by $3.1 million
- Discount rate: decreased from 7.25% to 7.00%
  - This increased the liability by $6.8 million
- All other assumptions and methods were maintained from the prior valuation

ACTUARIAL METHODS

Actuarial Cost Method

The Entry Age Normal Actuarial Cost Method has been used in this valuation. Under this method, the normal cost is the amount calculated as the level percentage of compensation necessary to fully fund the prospective benefits from each member's entry age to retirement age.

The actuarial accrued liability represents the theoretical accumulation of all prior years' normal costs for the plan members as if the program had always been in effect. The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over plan assets. The use of the Entry Age Normal actuarial funding method is consistent with the requirements of Chapter 32 of the Massachusetts General Laws.

Asset Valuation Method

Market Value of Assets, adjusted for payables and receivables, adjusted to phase in investment gains compared to the expected market value and losses evenly over three years (shown on page 14). The asset valuation method adjusts the results to no less than 85% and no more than 115% of the market value of assets adjusted for payables and receivables.

Fiscal Year Adjustment

The actuarial results are adjusted by the valuation interest rate and salary scale to the beginning of Fiscal Year 2022. The unfunded actuarial accrued liability is rolled forward with normal cost and further adjusted by anticipated contributions and interest.

Actuarial Methods and Assumptions (Continued)

ACTUARIAL ASSUMPTIONS

Valuation Date

January 1, 2020.

Investment Return

7.00% per year net of investment expenses. The investment return assumption is a long-term assumption and is based on capital market expectations by asset class, historical returns, and professional judgement.

Regular Interest Rate Credited to Annuity Savings Account

2% per year.

Cost-of-Living Increases

A 3% COLA on the first $12,000 of a member's retirement allowance is assumed to be granted every year.

Salary Increases

Select and Ultimate. Salary increases by employment group and years of service:

- Group 1 and 2: 4.75% for years 1-20; 3.00% all other years
- Police: 7.3% in year 1, 8.0% in year 2, 10.25% in year 25; 2.75% all other years
- Fire: 15.75% in year 1, 9.75% in year 2, 10.25% in year 25; 2.75% all other years

The prior valuation assumed 4.00% increases for all employees in all years of service; this change of assumption decreased the liability by $2.4 million.

Step increases are assumed to be part of the salary increase assumption. The total payroll is assumed to increase at 4.00% per year. The salary increase assumption reflects prior experience including PERAC's 2002 local experience study, current expectations, and professional judgement.

Actuarial Methods and Assumptions (Continued)

Credited Service

All service is assumed to be due to employment with the municipality.

Family Composition

Members assumed married with 2 dependent children – one male and one female both age 15; age difference between member and spouse assumed to be 3 years (the male being the older).

Administrative Expenses

Estimated budgeted amount of $286,647 for the Fiscal Year 2022 is added to the Normal Cost. The administrative expense does not include investment manager and custodial fees. These fees are considered part of the discount rate assumption that is net of fees.

Net 3(8)(c)

Net 3(8)(c) payments are assumed to be the same level as the past calendar year for all future years.

Contribution Timing

Contributions are assumed to be made at the beginning of the fiscal year.

In-Service Disability and Death

Both Disability and In-Service Death are assumed to be 45% ordinary and 55% accidental for Group 1 and 2, and 10% ordinary and 90% accidental for Group 4.

Withdrawal Prior to Retirement

The rates shown at the following sample ages illustrate the withdrawal assumption. Withdrawal rates are set to zero if the retirement rate at that age is nonzero.

Rate of Withdrawal

Service	Group 1 and 2	Group 4
0	15%	1.5%
1	12%	1.5%
2	10%	1.5%
3	9%	1.5%
4	8%	1.5%
5	7.6%	1.5%
10	5.4%	1.5%
15	3.3%	0.0%
20	2.0%	0.0%
25	1.0%	0.0%
30+	0.0%	0.0%

Disability Prior to Retirement

The rates shown at the following sample ages illustrate the assumption regarding the incidence of disability:

Rate of Disability

Age	Group 1 and 2	Group 4
20	0.01%	0.10%
25	0.02%	0.20%
30	0.03%	0.30%
35	0.06%	0.30%
40	0.10%	0.30%
45	0.15%	1.00%
50	0.19%	1.25%
55	0.24%	1.20%
60	0.28%	0.85%

Actuarial Methods and Assumptions (Continued)

Rates of Retirement

The rates shown at the following ages illustrate the assumption regarding the incidence of retirement, once the member has achieved 10 years of service:

				Hired after 4/1/2012		
Age	Group 1& 2 Male	Group 1 & 2 Female	Group 4	Group 1& 2 Male	Group 1 & 2 Female	Group 4
50	1%	1.5%	2%	0%	0%	0%
51	1%	1.5%	2%	0%	0%	0%
52	1%	2.0%	2%	0%	0%	0%
53	1%	2.5%	2%	0%	0%	0%
54	2%	2.5%	7.5%	0%	0%	0%
55	2%	5.5%	15%	0%	0%	10%
56	2.5%	6.5%	10%	0%	0%	7%
57	2.5%	6.5%	10%	0%	0%	20%
58	5%	6.5%	10%	0%	0%	10%
59	6.5%	6.5%	15%	0%	0%	15%
60	12%	5%	20%	25%	30%	20%
61	20%	13%	20%	20%	13%	20%
62	30%	15%	25%	30%	15%	25%
63	25%	12.5%	25%	25%	12.5%	25%
64	22%	18%	30%	22%	18%	30%
65	40%	15%	100%	40%	15%	100%
66	25%	20%	N/A	25%	20%	N/A
67	25%	20%	N/A	25%	20%	N/A
68	30%	25%	N/A	30%	25%	N/A
69	30%	20%	N/A	30%	20%	N/A
70	100%	100%	N/A	100%	100%	N/A

Mortality

RP-2014 table adjusted to 2006 and projected generationally with MP-2019 (sex-distinct). During employment the healthy employee mortality table is used. Post-employment the healthy annuitant table is used.

Mortality for disabled retirees follows the same table as non-disabled retirees, set forward 2 years. Death is assumed to be due to the same cause as the disability 40% of the time.

Appendix B – Summary of Principal Provisions

1. PARTICIPANT

Participation is mandatory for all full-time employees whose employment commences before age 65. There are three classes of members in the retirement system:

- Group 1: general employees
- Group 2: employees in specified hazardous occupations (e.g., electricians)
- Group 4: police and firefighters

2. MEMBER CONTRIBUTIONS

Member contributions vary depending upon date hired as follows:

Date of Hire	Member Contribution Rate
Prior to 1975	5% of Pay
1975 – 1983	7% of Pay
1984 – June 30, 1996	8% of Pay
After June 30, 1996	9% of Pay

Members hired after 1978 contribute an additional 2% of pay over $30,000.

3. PAY

a. Pay

Gross regular compensation excluding bonuses, overtime, severance pay, unused sick pay, and other similar compensation.

b. Average Pay

The average of pay during the three consecutive years that produce the highest average or, if greater, during the last three years (whether or not consecutive) preceding retirement. For members hired after April 1, 2012, five-year averages will be used.

4. CREDITED SERVICE

Period during which an employee contributes to the retirement system plus certain periods of military service and "purchased" service.

Summary of Principal Provisions (Continued)

5. SERVICE RETIREMENT

a. Eligibility

Hired prior to April 2, 2012:

- Attainment of age 55 and completion of ten years of credited service,
- or at any age with completion of 20 years of service.
- If hired prior to 1978 or a member of Group 4, the completion of ten years of service is not required.

Hired after April 1, 2012:

- Group 1 – Age 60 and Completion of 10 years of credited service;
- Group 2 – Age 55 and completion of 10 years of service;
- Group 4 – Age 55.

b. Retirement Allowance

Determined as the product of the member's benefit percentage, average pay and credited service, where the benefit percentage is shown below (maximum allowance of 80% of average pay):

Benefit Percentage	Group 1	Group 2	Group 4
2.5%	65+	60+	55+
2.4	64	59	54
2.3	63	58	53
2.2	62	57	52
2.1	61	56	51
2.0	60	55	50
1.9	59	N/A	49
1.8	58	N/A	48
1.7	57	N/A	47
1.6	56	N/A	46
1.5	55	N/A	45
	Hired after April 1, 2012*		
2.5%	67+	62+	57+
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

*Reduction is .125% for each year early instead of .15% per year for employees with over 30 years of service.

In addition, veterans receive an additional $15 per year for each year of credited service up to 20 years

Summary of Principal Provisions (Continued)

6. DEFERRED VESTED RETIREMENT

a. Eligibility

Completion of 10 years of credited service (for elected and appointed members, 6 years in the event of involuntary termination).

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section above with the member eligible to start collecting a benefit at age 55, (or age 57 for post-April 1, 2012 hires) or defer until later at his or her discretion. If a member chooses, his or her contributions with interest may be withdrawn. The amount of interest he or she will receive depends on length of service and whether or not the termination of employment was voluntary.

7. ORDINARY DISABILITY RETIREMENT

a. Eligibility

Non-job related disability after completion of 10 years of credited service.

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section and calculated as if the member had attained age 55 (or age 57 for those hired after April 1, 2012), if younger. Veterans receive 50% of pay (during final year) plus an annuity based on accumulated member contributions with interest.

8. ACCIDENTAL DISABILITY RETIREMENT

a. Eligibility

Disabled as a result of an accident in the performance of duties. No age or service requirement.

b. Retirement Allowance

72% of pay plus an annuity based on accumulated member contributions with interest. Also, a dependent's allowance per year for each child. Total allowance not to exceed 100% of pay (75% for members hired after 1987).

Summary of Principal Provisions (Continued)

9. NON-OCCUPATIONAL DEATH

a. Eligibility

Dies while in active service, but not due to occupational injury. 2 years of service.

b. Retirement Allowance

Benefit as if Option C had been elected (see below) and member had attained age 55 (or age 57 for those hired after April 1, 2012) if younger.

Minimum monthly benefits provided as follows:

- spouse - $500,
- first child - $120,
- each additional child - $90

10. OCCUPATIONAL DEATH

a. Eligibility

Dies as a result of an occupational injury.

b. Benefit Amount

72% of pay plus refund of annuity savings fund balance. In the case of an accidental disability retiree who dies of the same cause, the beneficiary receives 72% of the last 12 months salary or the current pension amount, whichever is greater.

11. COST-OF-LIVING INCREASES

An increase of up to 3% applied to the first $12,000 of annual benefit. Funded by the Employer from Fiscal Year 1999. Percentage increase is voted on each year by the Retirement Board. Cost-of-living increases granted during Fiscal Year 1982 through Fiscal 1998 are reimbursed by the Commonwealth.

12. OPTIONAL FORMS OF PAYMENT

- Option A: Allowance payable monthly for the life of the member.
- Option B: Allowance payable monthly for the life of the member with a guarantee of remaining member contributions with interest.
- Option C: Allowance payable monthly for the life of the member with 66-2/3% continuing to the member's beneficiary upon the member's death. If the beneficiary predeceases the member, the allowance amount "pops up" to the non-reduced amount.

Appendix C – Glossary of Terms

- **Actuarial Accrued Liability**
  The portion of the Present Value of Benefits that is attributable to past service.

- **Actuarial Value of Assets**
  The value of assets based on the asset valuation method shown in the Actuarial Methods and Assumptions section of this report.

- **Actuarial Assumptions**
  Estimates are made as to the occurrence of certain events that determine the level of benefits to be paid and how long they will be provided. The more important actuarial assumptions include the investment return on assets, salary increases and the rates of turnover, disability, retirement and mortality.

- **Actuarial Cost Method**
  The procedure that is used to allocate the present value of benefits between the liability that is attributable to past service (Actuarial Accrued Liability) and that attributable to future service.

- **Funding Ratio**
  The percentage of the accrued liability that is covered by the Actuarial Value of Assets.

- **GASB**
  Government Accounting Standards Board (issues guidance for disclosure of retirement system liabilities).

- **Normal Cost**
  The portion of the Present Value of Benefits that is attributable to benefits to be earned in the coming year.

- **PERAC**
  Public Employee Retirement Administration Commission, a division of the State government which has regulatory authority over the administration of the retirement system.

- **Present Value of Benefits**
  Represents the dollar value today of all benefits expected to be earned by current members if all actuarial assumptions are exactly realized.

- **PRIT**
  Pension Reserves Investment Trust Fund is the state controlled and administered fund for the investment of assets for members of the retirement system.

- **Unfunded Actuarial Accrued Liability**
  That portion of the Actuarial Accrued Liability not covered by System Assets.

PERAC Information Disclosure

The most recent actuarial valuation of the System was prepared by Stone Consulting, Inc. as of January 1, 2020

The normal cost for employees on that date was:	$3,219,008	9.3% of payroll
The normal cost for the employer was:	$1,687,088	4.9% of payroll

The actuarial liability for active members was:	$103,395,678
The actuarial liability for retired members was (includes inactives):	$172,436,775
Total actuarial accrued liability:	$275,832,453
System assets as of that date ($134,009,247.64 Market Value):	$131,246,880
Unfunded actuarial accrued liability:	$144,585,573

The ratio of system's assets to total actuarial liability was:	48%

As of that date the total covered employee payroll was:	$34,694,937

The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	7.00% per annum
Rate of Salary Increase:	Select and ultimate

SCHEDULE OF FUNDING PROGRESS (Dollars in $000's)

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b-a)/c)
1/1/2020	$131,247	$275,832	$144,585	48%	$34,695	417%
1/1/2018	$114,692	$261,800	$147,108	44%	$32,583	451%
1/1/2016	$104,037	$235,443	$131,406	44%	$30,675	428%
1/1/2014	$90,318	$212,597	$122,279	42%	$27,603	443%
1/1/2012	$81,376	$193,765	$112,389	42%	$27,049	416%